

WHAT IS CLAIMED IS:

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1. A method of screening agents for use in the prevention or treatment of cancer comprising:
- (a) contacting a vegetative cell of *Dictyostelium discoideum* with a test agent;
- (b) assessing the cytotoxicity of said test agent;
- (c) assessing the effect of said test agent on the expression of one or more of *repB*, *repD* and *APE* gene products; and
- 10 (d) comparing said cytotoxicity and said expression in the presence of said test agent with a vegetative cell of *Dictyostelium discoideum* not exposed to said test agent;
- wherein
- 15 (i) a test agent that is cytotoxic but does not induce expression of one or more of *repB*, *repD* and *APE* gene products will be useful as a chemotherapeutic;
- (ii) a test agent that is not cytotoxic but does induce expression of one or more of *repB*, *repD* and *APE* gene products will be useful as a chemopreventative; and
- 20 (iii) a test agent that inhibits the expression of one or more of *repB*, *repD* and *APE* gene products will be useful as a chemotherapeutic when applied in combination with a DNA damaging agent.
2. The method of claim 1, wherein assessing expression of *repB* is performed, and assessing expression of *repD* and *APE* is not performed.
- 25 3. The method of claim 1, wherein assessing expression of *repD* is performed, and assessing expression of *repB* and *APE* is not performed.

4. The method of claim 1, wherein assessing expression of *APE* is performed, and assessing expression of *repB* and *repD* is not performed.
5. The method of claim 1, wherein assessing expression of *repB* and *repD* is performed, and assessing expression of *APE* is not performed.
- 5 6. The method of claim 1, wherein assessing expression of *repB* and *APE* is performed, and assessing expression of *repD* is not performed.
7. The method of claim 1, wherein assessing expression of *repD* and *APE* is performed, and assessing expression of *repB* is not performed.
8. The method of claim 1, wherein assessing expression of *repB*, *repD* and *APE* is performed.
- 10 9. The method of claim 1, further comprising measuring, in a vegetative cell of *Dictyostelium discoideum* not treated with said test agent, the expression of the same gene or genes as measured in step (c).
- 10 10. The method of claim 1, wherein cytotoxicity is assessed by measuring clonal plating, trypan blue exclusion, phyloxine B dye exclusion, and degradation/laddering of DNA.
- 15 11. The method of claim 1, wherein expression is assessed by hybridization of a probe to a target nucleic acid.
12. The method of claim 11, further comprising RT-PCRTM.
- 20 13. The method of claim 12, wherein said probe is a member of a primer pair for RT-PCRTM and comprises a label.
14. The method of claim 13, wherein the label is a radiolabel, a fluorophore label, a chemilluminescent label, an enzyme label or a ligand.
15. The method of ^{claim}14, wherein the ~~ligand~~ is biotin, and the ligand is detected by contacting with enzyme-conjugated avidin and a detectable enzyme substrate.

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16. The method of claim 11, further comprising binding target nucleic acid to a substrate.
17. The method of claim 16, wherein said substrate is a nylon or nitrocellulose membrane.
- 5 18. The method of claim 16, wherein said probe is labeled with a radiolabel, a fluorophore label, a chemiluminescent label, an enzyme label or a ligand.
- 10 19. The method of claim 1, wherein expression is assessed by means of an expression cassette stably transformed into said a vegetative cell of *Dictyostelium discoideum*, said expression cassette comprising a nucleic acid segment encoding a detectable reporter enzyme under the transcriptional control of a *repB*, *repD* or *APE* promoter region.
20. The method of claim 19, wherein said detectable reporter enzyme encodes β -galactosidase, β -glucuronidase, luciferase or green fluorescent protein.
- 15 21. The method of claim 1, wherein said assay further comprises a positive control for inhibition of expression of one or more of *repB*, *repD* and *APE* gene products.
22. The method of claim 1, wherein said assay further comprises a positive control for induction of expression of one or more of *repB*, *repD* and *APE* gene products.
23. The method of claim 1, wherein said assay further comprises a positive control for cytotoxicity.
- 20 24. The method of claim 1, wherein said assay further comprises a negative control for inhibition of expression of one or more of *repB*, *repD* and *APE* gene products.
25. The method of claim 1, wherein said assay further comprises a negative control for induction of expression of one or more of *repB*, *repD* and *APE* gene products.
- 25 26. The method of claim 1, wherein said assay further comprises a negative control for cytotoxicity.

27. The method of claim 1, wherein said test agent is a naturally-occurring molecule.
28. The method of claim 1, wherein said test agent is a synthetic molecule.
29. The method of claim 1, wherein said test agent is a synthetic derivative of a naturally-occurring molecule.
- 5 30. The method of claim 1, further comprising assessing DNA damage in said cell.
31. The method of claim 30, wherein assessing DNA damage comprising mass spectroscopy.
32. A vegetative cell of *Dictyostelium discoideum* stably transformed with an expression cassette comprising a nucleic acid segment encoding a detectable reporter enzyme under the transcriptional control of a *repB*, *repD* or *APE* promoter region.
- 10 33. A method of making a compound for use in the prevention or treatment of cancer comprising:
- 15 (a) contacting a vegetative cell of *Dictyostelium discoideum* with said compound;
- (b) assessing the cytotoxicity of said compound;
- (c) assessing the effect of said compound on the expression of one or more of *repB*, *repD* and *APE*;
- 20 (d) comparing said cytotoxicity and said expression in the presence of said compound with a vegetative cell of *Dictyostelium discoideum* not exposed to said compound; and
- (e) making said compound.